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ABSTRACT

This paper selectively reviews research on the relationship between topic interest and prior knowledge, and discusses the optimal association between these variables. The paper points out that interest has a facilitating impact on learning, and at least part of this effect must be ascribed to prior knowledge. While the interest-knowledge association may account for about 20 percent of the variance, 80 percent of the variance in the effects of interest may then be unaccounted for by prior knowledge, leaving a considerable portion of independent variance with which interest can affect learning. Research suggests that interest contributes to learning in the following ways: it seems to invoke deeper types of comprehension processes, leads to greater use of imagery, and may arouse a more personal and extensive network of relevant associations than are invoked by prior knowledge. Analysis of a model of interest-prior knowledge relationships suggests that categories of high interest and low knowledge, and low interest and high knowledge, are likely to be transitory. Suggestions are made to divide topic interest into specific and domain interests. The advantages of educational research on interest or curiosity are discussed. (Contains approximately 55 references.) (JDD)

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Interest and Prior Knowledge

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A great deal of research has been devoted to the clarification of the cognitive processes involved in learning from instruction. While these efforts have done much to explain the complexities of human learning, they have also emphasized how little is known about the influence of affective factors on learning and cognition. It is commonly assumed that affective variables have an indirect energizing effect on learning by acting on the cognitive processes controlling what people learn. Little is known, however, about the specific cognitive processes engaged by affective variables, nor has their presumed energizing role on cognition been verified by research.

Many researchers have suggested that it is particularly important to develop a better understanding of the impact of motivation on cognitive processes. An increasing number of studies have examined that question by investigating the motivational effects of interest. One of the major problems with the construct of interest is its close relationship to prior knowledge. Since the two constructs are so often confounded, the primary purpose of this paper is to selectively review research on this relationship and to discuss the optimal association between these variables. A model of the interest-prior knowledge association will be updated and, finally, the relationship between curiosity and interest discussed.

A distinction has been drawn between situational and topic or individual interest (Renninger, Hidi, & Krapp, 1992). Situational interest is elicited by aspects of a situation, such as novelty or intensity, and by the presence of a variety of human interest factors contributing to the attractiveness of different types of content. Topic or individual interest refers to peoples' relatively enduring preferences for different topics, tasks, or contexts and how they influence learning. This paper will be concerned with the relationship between topic interest and prior knowledge, and when the word interest is mentioned alone it is intended to refer only to topic interest.

Importance of Interest

Clarifying the effects of interest on learning, retention, and cognitive processing is important for many reasons. First, Deci (1992), as well as Deci and Ryan (1991) have indicated

that since people enjoy tasks that interest them, whether they lead to the attainment of rewards and other goals or not, studies of interest's impact are central to an understanding of the effects of intrinsic motivation. Deci and Ryan (1991) suggest that one definition of "intrinsically motivated behaviors are those the person undertakes out of interest" (p. 241) making the two virtually synonymous. Second, interests seem to be stable and long lasting among adults (Hidi, 1990; Schiefele, 1991). From the perspective of educational research and practice, such stability suggests that adapting instruction to students' interests may have positive motivational characteristics for long periods of time. Therefore, teachers may tailor both the content of instruction and the context in which it occurs to student's enduring interests. Such adaptations also appear possible in computer based instructional systems in which both the contexts and examples of the instructional material could be suited to students' interests.

A third reason for the importance of research on interests is that it is ubiquitous. It is difficult to find anyone who is not interested in something. Teachers who complain about student apathy and boredom, usually mean that the students are indifferent to what they have to learn in school. However, these same students are usually quite interested in many activities that are unrelated to school. It is a challenging and potentially rewarding task to tailor instruction to students' interests in order to harness the motivational effects of such adaptations for school learning. Fourth, at a time when the relevance of research and scholarly activities has become an important concern for students, colleagues, and potential sources of funding for research, investigations of interest have face validity since it has long been assumed that people work harder and learn more on tasks related to their interests than on others. It is reassuring to note that recent research has confirmed this relationship (Renninger, Hidi, & Krapp, 1992).

Finally, studies of interest can also help to establish a much needed link between research on motivation and cognitive processing sought both by researchers on motivation (Sorrentino & Higgins, 1986; Appley, 1991) and by those investigating cognitive processing during training and instruction (Paris, 1988; Paris, Wasik, & Turner, 1990; Tobias, 1988). Instructional researchers,

puzzled by results indicating that students' use of cognitive processes during learning from instruction were ineffectual, raised questions such as the following:

> "If students' behavior is as variable, un-strategic, and ineffective as these results suggest, how were these college students ever able to advance to nigher educational levels? Furthermore, how could society have evolved to its highly complex post-industrial state, if the professional, clerical, and blue collar work force is as bereft of cognitive skills as the contemporary research suggests?" (Tobias, 1989, p. 222)

Perhaps the findings of ineffective cognitive processing may be attributed to students' disinterest in the tasks they were working on, i.e., their interests or other motivational processes were not engaged by the tasks they were to perform.

Relationship of Interest and Prior Knowledge

It is almost a truism that people know more about topics related to their interests than they do about others. Some researchers (Asher 1980; Tobias, 1992a) attempt to distinguish between the effects of interest and prior knowledge. Others deal with this problem simply by acknowledging the relationship in their definitions of interest. For example, Renninger (1992; Renninger, Lasher, & Crowley, 1991) explicitly identifies interest as being composed of value and knowledge. While that is an accurate definition supported by a good deal of research, to be discussed below, it does not clarify the fundamental problem of whether research results ascribed to interest may actually be accounted for wholly, or largely by the effects of prior knowledge. Dochy (1993) reported that prior knowledge accounts for 20%-40% of the learning variance in ecologically valid settings, and an incredible 60%-80% in experimental contexts. In view of these substantial effects it becomes essential to examine whether the impact of interest on learning is independent of the effects of prior knowledge.

Alexander, Schallert, and Hare (1991; see also Alexander, Kulikowich, & Schulze, 1992, 1993) advanced a useful distinction between different types of subject matter knowledge. They suggest that topic knowledge refers to prior familiarity with content closely related to material covered in a particular text passage or segment of instructional material, whereas domain

knowledge deals with familiarity with general information in an area, even though it may not be specifically referred to in a particular passage. In the following discussion, studies indicating negligible association between interest and prior topic or domain knowledge will be discussed first, followed by those reporting significant relationships.

Findings of Minimal Interest-Prior Knowledge Relationships

Chou and Devine (1983) found that first grade students' interests were not significantly related to comprehension of a story about dolls and that interest did not necessarily connote high domain knowledge about that subject. In this study girls had significantly more interest in dolls than boys [r(sex & interest) = .74], but surprisingly boys were reported to have as much general knowledge about dolls as girls. It seems likely that these findings were attributable to the possibility that boys may have been more interested in dolls than they acknowledged since dolls are stereotypically regarded as more appropriate toys for girls.

Baldwin, Peleg-Bruckner, and McClintock's (1985) study is frequently cited in support of a low interest-prior knowledge relationship. These researchers assessed students' prior interest by rating their reactions to story titles. Domain knowledge was measured by multiple choice questions which did not cover the content of the passages students read subsequently, but were selected from the same general content domain. A non-significant mean correlation of only .09 was found between prior domain knowledge and interest. This low relationship may be attributed to an unusual ideographic method of assigning students to knowledge groups. Students were classified as high or low relative to their own interest and knowledge rankings of all the topics used in that study, rather than determining their standing in comparison to a group. Such assignments may generate a good deal of error, because the lowest or highest interest or prior knowledge ranking of one student may actually be higher/lower than the knowledge or interest of other students assigned to the same category.

An unpublished dissertation (Saks, 1988) attempted to extend the Baldwin et al (1985) investigation and used essentially the same text materials employed by Baldwin et al. This study differed from Baldwin et al's in that interest was determined by ratings of both the title and a one

sentence summary of the texts students read subsequently. Furthermore, high and low interest and domain knowledge categories were not assigned ideographially, but were established in comparison to a group of peers. The median correlation between interest and prior knowledge was low, but significant ($r = .18$, $p < .05$). This relationship may well have been attenuated by the low reliabilities of some of the prior knowledge subtests (range from .79 to .21, median= .33). Baldwin et al (1985) reported only one reliability coefficient of .82 for all pretests combined; reliabilities for the subtests used to assign students to high/low groups were not provided. Unexpectedly, no relationship was found in either Saks' or Baldwin et al's study between prior domain knowledge and a posttest measuring students' comprehension of the text passage.

Long, Winograd, and Bridge (1989) had students read four different passages and reported no interest-prior topic knowledge relationships. However, it should be noted that interest ratings were obtained after students read the text and may therefore be confounded with students' perception of the difficulty of the passage and their comprehension of it. The comprehension and interest correlation of .32, though non-significant, was similar to the .40 correlation of comprehension with prior knowledge, however only the latter relationship was significant ($p < .05$). The authors also indicated that "the experimental task may have been too difficult for the students" (p. 367).

Schiefele conducted a series of important studies relevant to the interest-prior knowledge question. In one of these (1990, 1992a) an abstract of the text selection to be read was rated for interest; the total interest score consisted of the sum of two subscales designed to measure feeling related (alpha reliability = .91) and value related (alpha reliability =.89) reactions. Prior knowledge was determined by a word association test and by five open-ended questions dealing with domain knowledge of "basic aspects of the text" (1990, p. 327). After reading a five page passage dealing with the "Psychology of Emotion," 53 computer science students received 12 open-ended questions; six of these items were composed of simple items demanding recall of concrete details, three complex knowledge questions demanded "groupings of facts, or relations between facts" (1992a, p. 165), and three questions of deeper comprehension required re-

combination of knowledge, comparisons of text segments, and application to new situations. Different point values were assigned to answers and converted to z scores for statistical analysis.

Schiefele found a main effect for interest only on the deeper comprehension questions. There were no intelligence, short term memory, or prior knowledge differences between high and low interest groups. However, Schiefele is careful to point out that "the validity of the tests of prior knowledge must be called into question....it is possible that relevant bits of prior knowledge were in fact present, but could not be measured" (p. 336). Furthermore, it was also noted "that the level of professional understanding of the concept 'emotion' was quite low" (1990, p. 335).

In a second study Schiefele (1991, 1992a), used 41 social science students reading a text on communication, followed the same procedures outlined in the study above. A recognition posttest designed to tap deeper comprehension processes consisted of verbatim and paraphrased sentences, as well as sentences whose meaning or correctness had been changed. Data were converted to d' values used in signal detection theory and an overall significant difference followed by planned comparisons indicated that students with low interest had more correct verbatim responses than their high interest counterparts, and that they were more likely to judge correct sentences to be false than low interest students. Interest and prior knowledge were significantly correlated ($r=.42$, $p<.05$). Since prior knowledge was again found to be unrelated to comprehension outcomes, it was not surprising that correlations between interest and type of comprehension were essentially unchanged when the effects of knowledge were partialled out.

Schiefele (1992b) used the same type of comprehension and interest measures in a study of the effects of interest on students' understanding of two texts: one dealt with prehistoric peoples and the other with television. Prior topic knowledge, assessed by multiple choice tests, was found to be unrelated to interest for both passages. Regression analysis using d' values found interest to be negatively associated with verbatim representation and positively related to propositional representation for both texts. Additional regression analyses of raw scores found that interest affected only the responses to paraphrased text sentences. Prior topic knowledge contributed only to propositional representation of the television text. Commenting on the low

relationships between prior topic knowledge and comprehension, Schiefele indicates that "both texts were clearly below the subjects' grade level. Therefore .... understanding them did not depend on topic-specific knowledge" (p. 13).

Schiefele and Krapp (1991) used the same communication text and interest rating scales in a study examining the effects of interest on a variety of comprehension measures. Prior topic knowledge was assessed by multiple choice and open ended questions. "Intelligence, prior knowledge, and topic interest were not significantly interrelated" (p. 13), though these relationships may have been attenuated by the fact that "most subjects were not familiar with the topic of the experimental text and had only very limited amounts of topical knowledge" (p. 17). Interest affected recall of total idea units, total main ideas, and coherence of recall, while prior knowledge was related only to recall of total idea units.

Substantial Prior Knowledge-Interest Relationships

Morris, Tweedy, and Gruneberg (1985) found a median correlation of .72 between knowledge about various soccer teams and interest, measured in terms of students' attitudes to those teams. It was notable that positive interest (rooting for a particular team) and negative interest (disliking a team) had similar effects on recall of soccer scores. The authors speculated that emotional involvement may be an important contributor to the enhanced performance attributed to interest.

Schneider and Bjorklund (1992) also reported on the relationships between knowledge and interest in soccer. Their data were based on re-analyses of a series of studies using large samples of German school children. Interest-knowledge relationships were found to be significant in every one of three studies and correlations between interest measures (alpha reliability .76 and .67 for second and fourth graders respectively) and domain knowledge measures (alpha reliability= .70 and .73 for second and fourth graders) tended to increase with the age of the students. The lowest reported correlation was .25 for second graders and the highest was .67 for fourth graders.

Tobias (1992a) examined the effects of interest on the acquisition and use of metacognitive checking techniques in mathematics. Self report Likert scales of interest (alpha reliability = .87) and domain knowledge (alpha reliability= .93) were significantly correlated (r=.53, p<.01). Garner and Gillingham (1991) measured interest while students were reading the text and found a significant association with topic knowledge.

Entin and Klare (1985) found that readability, prior domain knowledge (determined by asking for definitions of vocabulary assumed to be understood by the reader and not defined in the text), and interest affected reading comprehension (measured by a cloze procedure) of six passages read by their subjects. In one analysis the effects of interest were non-significant once prior knowledge was used as a covariate, but in a series of analyses main effects were usually found for interest and prior knowledge, but there were not interactions between these variables. While correlations between interest and prior knowledge were not reported, the authors suggest that "measures of prior knowledge were confounded with interest, i.e., subjects rated their prior knowledge of the interesting topics as high relative to their prior knowledge of the uninteresting topics. Over a range of topics, subjects seemed unable to differentiate these two factors (p. 29)."

Alexander, Kulikowich, and Schulze (1993) summarized data dealing with various aspects of the relationship between both domain and topic knowledge and interest. Two different passages dealing with physics were used in that study. On the more technical passage the domain knowledge-interest correlation was .28 (p < .01); the topic knowledge data could not be correlated since there was little relevant knowledge in the sample and the data were not normally distributed. On the second passage both domain and topic knowledge were strongly associated with interest (Beta weights = .13 and .62, respectively, p < .01). Alexander et al divided the sample into three categories on the basis of their domain knowledge. The interest-domain knowledge relationship was highest on both passages for students who knew most about the domain (r=.31, p < .05). The correlations were not significant for either the intermediate knowledge levels or the least knowledgeable students.

Optimal Interest and Prior Knowledge Relationships

Kintsch (1980) differentiated between emotional and cognitive interest, the former being roughly equivalent to situational interest and the latter similar to topic interest. Kintsch predicted an inverted U shaped relationship between cognitive interest and prior knowledge, in which moderate topic knowledge was expected to generate more interest than either high or low levels. He reasoned that interest would be low with little or no relevant knowledge, was likely to increase as enough was known about the topic to relate it to different schemas, and diminished again as knowledge increased to the point where nothing new can be learned. This formulation was supported by Hidi and McLaren (1990) who found low interest ratings for topics about which there was high or low knowledge, and higher interest for topics about which there was moderate knowledge. Similarly, Garner and Gillingham (1991) found that students with high and low levels of topic knowledge seemed to rate text passages as less interesting than those with moderate levels.

It is important to note that Kintsch's (1980) paper presented a model to predict the level of interest people are likely to have in a particular text passage, rather than hypothesizing about the form of the interest-knowledge relationship in the population. Clearly, as Kintsch indicates, if students know nothing - or everything - discussed in a particular text passage, they will have little interest in reading that particular selection. However, the model does not predict that knowledgeable students would be similarly disinterested in reading other passages about the same topic with which they are less familiar. Indeed, there is every reason to believe that among such students' interest in more novel passages dealing with the same content would be high, though it is also probable that the more knowledgeable individuals are about a topic the less likely is it that any material would be entirely novel to them.

While there appears to be no research on interest comparisons between experts and novices, it seems evident that experts in any field, whether it is chess or comprehension from text, would have both the highest interest and knowledge about that topic. One of the hallmarks of expertise in any area is an intense devotion to the subject, often to the exclusion of most other activities and pleasures (Roe, 1951a, b). The dedication and persistence with which those with

expertise in a domain pursue activities related to that field suggests that they are deeply interested in that topic and would seem to contradict an inverted U shaped interest-knowledge relationship in the population.

Alexander et al's (1993) findings also contradicted an inverted U shaped interest-knowledge relationship. As indicated above, domain knowledge was found to be unrelated to interest in two text passages for students with low and intermediate levels of knowledge and was significantly correlated only for the most knowledgeable subjects in the sample. Furthermore, these investigators also conducted a paragraph by paragraph analysis of interest and found that the knowledgeable group had the highest interest ratings on every paragraph of two text passages compared to intermediate and low knowledge groups, which seemed to have fairly similar interest ratings. Both of these findings suggest an essentially linear interest-knowledge relationship

General Discussion

As suggested previously (Tobias, 1992a), it seems unrealistic to assume that there is, or should be, little relationship between domain knowledge and interest. People with high interest in anything probably acquired more prior knowledge about that subject than those less positively disposed towards it since they are likely to have spent much more time on activities related to that field. If interest has a facilitating impact on learning, and there is a lot of research indicating that it does (Renninger, Hidi, & Krapp, 1992), at least part of this effect must be ascribed to prior knowledge. If the effects of interest and prior knowledge are not separated, the facilitating influence ascribed to interest may actually be caused by prior knowledge, rather than by the motivational properties attributed to interest.

The burden of evidence suggests a strong, essentially linear interest-prior knowledge relationship. While the interest-knowledge association appears substantial and may account for about 20% of the variance, 80% of the variance in the effects of interest may then be unaccounted for by prior knowledge, still leaving a considerable portion of independent variance with which interest can affect learning. In view of the integral relationship between these two constructs, it seems vital that measures of prior knowledge be collected in interest research. Then, some

attempt should be made to determine their independent effects by partialling out the influence of knowledge statistically, by blocking on that variable in research designs, by computing analyses of covariance, or by accounting for it in some other way.

Problems in Interest-Prior Knowledge Studies

Studies reporting minimal relationships between prior knowledge and interest appear to be characterized by one, or a combination, of the following: little relationship between domain and topic knowledge, questionable reliability or validity of the scales used, unusual method of assigning students to high/low categories, text passages not suited to the sample used, or possible confounding of interest and achievement measures. Each of these possibilities will be discussed below.

In many of the studies reporting negligible interest-prior knowledge relationships the prior knowledge assessed often had low, non-significant relationships with outcome measures. Such findings are surprising in view of Dochy's (1993) report of the powerful effects of prior knowledge on outcomes. It seems likely that the knowledge assessed in these studies had little to do with the topic knowledge covered in the text passages read by students. Reports of low interest-knowledge relationships were probably attributable to this difference and to the possibility that students may have believed that the interest scales referred to different topics than the prior domain knowledge tests.

Further problems in some studies dealt with the method of assigning students to categories which could have introduced noise into the determination of the relationship between interest and prior knowledge (Baldwin et al, 1985). Also, the reliability and validity of interest and/or prior knowledge measures used in some studies were low. Furthermore, it should be noted that many studies fail to provide the reliabilities of the interest or prior knowledge scales used. Since self-report measures such as these may be subject to considerabale error it is difficult to assess the meaning of any relationships obtained with scales for which such essential information is lacking.

Many of the investigations reporting low interest-knowledge relationships used text passages which were not well matched to students. Some investigators (Schiefele 1992b, 1990;

Alexander et al, 1993; Tobias, 1992a) comment specifically that the materials were either too easy, too difficult, or poorly suited to the sample used. Such problems are likely to reduce the range of scores on tests used to assess either interest or prior knowledge, which in turn affect the interest-prior knowledge relationships. Finally, it is important that the interest measures are obtained prior to exposure to the materials if the studies are to have pertinence to the interest-knowledge relationship. Obtaining ratings after the task (Chou & Devine, 1983), or even during reading (Garner & Gillingham, 1991), introduces the possibility that the interest can be affected by the perceived difficulty of the passage.

Impact of Interest on Learning

Renninger's (1992) definition of interest as being composed of knowledge and value, is useful in acknowledging the close interest-prior knowledge relationship. The findings reviewed above suggest that interest may have an energizing effect on learning, by initiating, maintaining, and directing activity. In addition, interest seems to engage "deep" comprehension processes. It was previously hyothesized (Tobias, 1992a) that interest aroused more pleasant emotions than did prior knowledge and that it activated a wider network of relevant, personal experiences. That hypothesis is supported by Schiefele's (1992b) findings that interest was associated with self-reports of activation, involvement, happiness, concentration, and intrinsic motivation for both texts used in that study. Similarly, Schiefele and Krapp (1991) found interest to be related to self-report measures of activation, intensity of attention, use of elaborative strategies, and amount of note taking, while prior knowledge was correlated only with reading time.

The prediction of greater emotional arousal in areas of interest than non-interest was also supported by Saks' (1985) findings or more personal involvement for such content. Similarly, Wade, Schraw, Buxton, and Hayes (1991) also reported that readers more frequently related information to background knowledge and experience on interesting text segments than on less interesting material. These findings support the hypothesis of increased activation of personal experiences and heightened emotional arousal for interest compared to prior knowledge. The activation of a wider and more personal experiential network by interesting content may help to

relate new learning to present, past, and future events of importance to the individual, and could contribute to the pleasure people experience in returning again and again to topics of interest to them.

Research has also reported greater use of visual imagery on interesting material, than on other content. Saks (1985) found that students tended to picture scenes that came to mind while reading interesting material. Samples of student comments in Saks' study illustrate the point: "I saw my own dog when I read the Dog passage", "I saw myself play basketball when I read about the rules of the game," and "I saw the image of the space shuttle blow up when I read about the spacecraft."

Long, Winograd and Bridge (1989) also report positive correlations between interest "and the amount of imagery reported both during and after reading....3 of the 4 passages used in the study" (p.362). It should be noted that use of imagery, like interest, has been associated with increased comprehension (Levin, 1981, Anderson & Kulhavy, 1972) deeper levels of comprehension (Steingart & Glock, 1979; Sadoski, 1983), and taking pleasure in reading (Nell, 1988). Clearly, the relationship between imagery and interest is a promising area for further investigation. Such additional research may help to specify the cause-effect relationships between these variables in facilitating comprehension.

The greater recall of personal experiences and increased use of visual imagery engaged by interest may be two of the reasons for the reported facilitation of learning and recall. Such processes are likely to make material more vivid and distinctive and lead to both more frequent, and to "deeper," cognitive processing of input reported in several investigations (Schiefele (1991, 1992a,b; Schiefele and Krapp, 1991). Further research investigating whether interesting material elicits more effective cognitive processing of instruction is needed to specify the mechanisms by which interest facilitates learning. It should also be noted that such research can make an important contribution to increasing our understanding of the impact of affect on cognition. Investigations of the effect of interest on metacognition (Tobias, 1992a, 1993) and on accessing

otherwise inert knowledge (Kaufman, 1993) are underway, and a study of the influence of interest on resisting the effects of distraction (Walters, 1993) has been proposed.

It should be reemphasized that the preceding expectations about the impact of interest should be verified by research in which the independent contributions of both interest and prior knowledge can be reliably assessed. Until then, they should be considered as being little more than hypotheses, since problems in many of the studies reviewed make it impossible to determine the contributions of prior knowledge to these effects.

A Model of Interest-Prior Knowledge Relationships

A model of the interest-knowledge relationship (Tobias, 1992a) attempted to clarify the development of that association by dividing both variables into high and low categories, see Figure 1. It should be noted that such a division is arbitrary and used only for convenience in discussing

Insert Figure 1 about here

some of these issues. It is not intended to imply that there is a dichotomous relationship between these variables, nor is it meant to predict the shape of that relationship in the population.

It seems sensible that high interest ought in most cases to be accompanied by substantial knowledge. Preference for a particular topic or activity predictably leads to greater engagement with it and to the accumulation of more knowledge about that subject. Conversely, the low interest low knowledge category is also easy to understand, since when people have limited contact with a subject they are unlikely to acquire very much knowledge about that domain.

The high interest low knowledge category is more difficult to understand, at least in adults. Conceivably, some adults may be attracted to a topic or activity by such attributes as novelty, the unexpected, and different life situations, among other characteristics which have been shown to evoke situational interest (Hidi & Anderson, 1992; Kintsch, 1980), and have limited knowledge of it for a short time. Situational interest may be aroused by such attributes in the absence of much knowledge about the subject. But, if these adults develop long term preferences for that activity and desire to seek it out (i.e., if situational interest develops into individual or

topic interest) they are unlikely to remain ignorant about it for very long. Hidi (1990), Hidi and Anderson (1992), and Alexander et al (1993) also suggest that situational interest accompanies initial learning in a domain, and may give rise to the development of topic interest. From these perspectives then, for adults the high interest low knowledge quadrant can be expected to be highly transitory. The development of topic interest will ultimately lead these people to become knowledgeable about the activity, or if they lose interest they are likely to remain ignorant about the area.

Children, on the other hand, might well be attracted to some topic or activity and have little opportunity to learn very much about it. For children, two possible outcomes of high interest and low knowledge about anything can be envisioned. If the interest persists, one would expect that children would also begin to accumulate knowledge about the topic or activity. Or, as children become involved with the area which attracted them initially, they might find it more difficult or less rewarding than originally anticipated. In that case, their interest may become reduced over time.

Consequently, people with situational interest and little knowledge about an area may ultimately change to have either low individual interest-low knowledge, or high individual interest-high knowledge about that field. Thus for both adults and children the high interest-low knowledge quadrant is most likely to change fairly rapidly. If this reasoning is correct, it may be helpful to investigate whether people eventually do indeed become more knowledgeable about areas that arouse their interests, or if they do not, whether their interest in such subjects is gradually reduced. It should be noted that research on the relationship between situational and individual interest is sorely needed, especially on whether and how situational interest arouses topic interest.

The low interest-high knowledge quadrant seems to be less complex. Schools and teachers have always induced students to learn subjects they care very little about. Hidi and McLaren (1988) indicated that this state of affairs applied mainly to children. It may be suggested

that as long as students care about how teachers evaluate their work the students may be induced to acquire knowledge about topics in which they have very little interest, irrespective of their age.

It can be predicted, however, that the low interest-high knowledge category is also likely to be very transitory in adults since knowledge about a subject in which there is little interest may be difficult to retrieve. People are unlikely to renew or update such knowledge with ongoing activity. While long term memory is an effective storehouse of information, it could be expected that this type of knowledge is most likely to become and remain inert (Bransford, Vye, Adams, & Perfetto, 1989). Ultimately then, people with low interest and high knowledge about something are most likely to become very similar to those with low interest and low knowledge. Of course, we are then left with the high-high and low-low categories, which have always been the components of a high positive correlation. Clearly, these conjectures regarding interest and prior knowledge should also be investigated.

Research is also needed on the relationships among interest and topic and domain knowledge. Alexander et al (1993) have proposed that at the initial stage of domain learning students are likely to have a fragmented knowledge of the field and little topic knowledge; they suggest that at this stage students exhibit mainly situational interest. As students become more familiar with an area increasing breadth and depth of domain knowledge is assumed and topic knowledge is also expected to become more extensive. At this stage topic interest increases, and together with situational interest, is assumed to have a moderate impact on learning. At a proficient or expert level, both domain and topic knowledge are assumed to be extensive. Alexander et al expected that situational interest would be less important than topic interest at this stage, though their results indicated that both novice and knowledgeable readers regarded personally involving information as most interesting.

Specific and Domain Interest

It may be useful to distinguish between interest in a specific passage or activity, and more general interest in the domain to which that activity belongs, just as it has been useful to differentiate between topic and domain knowledge. Specific interest may be defined as a

preference for particular activities, text segments, or bodies of content, and domain interest as a preference for activities in a wider knowledge domain. As indicated in the discussion of Kintsch's (1980) model above, experts are likely to be both knowledgeable and interested in most activities dealing with the domain of their expertise, other than the ones they have already mastered. Thus, they will have low specific interest for reading materials with which they are thoroughly familiar, but high interest in other materials from that domain with which they are less conversant. For example, someone might be very interested in the domain of word processing programs, but reluctant to read very much about the specific program on which they have attained considerable expertise. However, the same person would probably be pretty interested in reading a passage comparing the advantages and disadvantages of the program they use to other word processing programs. Distinguishing between specific interests in a particular passages or activity, and interest in the more general domain may clarify such ambiguities.

Previous research has shown that prior domain knowledge was often unrelated to recall and comprehension measures, though topic knowledge was usually associated with such outcomes. Similarly, it may be expected that the most accurate prediction of an individual's interest in a specific activity or text passage is likely to be made from their reactions to a sample of that passage. Domain interest, on the other hand, is most likely to predict individuals' interests in a range of activities, or text passages dealing with the field, or body of knowledge in general. Furthermore, it can be predicted that specific interests are likely to be most highly related to topic knowledge, and domain interests to knowledge of that domain.

Interest and Curiosity

A number of researchers (Hidi & Anderson, 1992; Krapp, Hidi, & Renninger, 1992) acknowledge the similarities between curiosity and interest and also distinguish between the two constructs in considerable detail. While such taxonomic distinctions are useful for the purpose of clarification, ultimately the best criterion of the value of a construct will be the degree to which it stimulates research, clarifies phenomena, predicts results, and is a useful guide to practice. Specific and domain interest may very well be more useful constructs in educational research than

curiosity, since interests deal not only with the energizing aspects of impelling individuals to activity, but also focus on the content of the activity. Specification of the content may be especially important for educational researchers concerned with understanding how to stimulate students' interests in the school curriculum, and the complexities of adapting instruction to students' interests.

One advantage of the curiosity construct over interest, as Spielberger and his associates (Spielberger & Starr,in press; Spielberger, Peters, & Frain, 1981) have pointed out, is that it can be related to research on anxiety. These researchers have proposed a model that predicts, as a continuous function, three apparently different states: an eagerness to approach some activities and situations motivated by curiosity and interest, neutral reactions, and disinterest leading to flight from other material motivated by anxiety. Since evaluative anxiety has been shown to be of some importance in school situations (Tobias, 1992b; Hembree, 1988, Wigfield & Eccles, 1989), and there is a body of research dealing with anxiety about specific content areas such as mathematics, (Hembree, 1989) and science (Mallow, 1982), among others, investigations of the Spielberger model may also be of some interest to researchers concerned with education.

It should also be noted that an additional advantage of curiosity as a construct is that a number of curiosity measures are available and have been used for some time including the Sensation Seeking Scale (Zuckerman, Kolin, Price, & Zoob (1964; Zuckerman, 1979); Pearson's (1971) Novelty Experiencing Scale, the Academic Curiosity Inventory (Vidler & Rawan, 1974, 1975), and the State and Trait Curiosity Inventory (Spielberger & Butler, 1971). Use of these measures may reduce some of the reliability and validity problems with interest scales mentioned above. Combining these curiosity measures with widely known anxiety scales can offer some potentially useful tools for research describing the continuum from attraction to some content motivated by curiosity/interest to flight from it motivated by anxiety.

Conclusion

A review of research has suggested a substantial relationship between interest prior knowledge. Research suggests that interest contributes to learning in the following ways: it seems

to invoke deeper types of comprehension processes, leads to greater use of imagery, and may arouse a more personal and extensive network of relevant associations than are invoked by prior knowledge. Research is needed in which both interest and prior knowledge about the same topic are assessed so that the percentage of independent variance attributable to these two constructs may be determined. An analysis of the interest-knowledge relationship, suggested that categories of high interest and low knowledge, and low interest and high knowledge were likely to be transitory. Suggestions were made to divide topic interest into specific and domain interests, and the advantages of educational research on interest or curiosity were discussed.

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